

What is claimed is:

1. A speech coding apparatus for coding an input signal consisting of one of a speech signal and a voice-band non-speech signal, said speech coding apparatus comprising:

5 discriminating means for deciding as to whether the input signal is a speech signal or a non-speech signal;

frequency parameter generating means for outputting, when the input signal is the speech signal, frequency parameters that indicate characteristics of a frequency spectrum of the speech 10 signal, and for outputting, when the input signal is the non-speech signal, frequency parameters obtained by correcting frequency parameters that indicate characteristics of a frequency spectrum of the non-speech signal;

15 a quantization codebook for storing codewords of a predetermined number of frequency parameters; and

quantization means for selecting codewords corresponding to the frequency parameters output from said frequency parameter generating means by referring to said quantization codebook.

20 2. The speech coding apparatus according to claim 1, wherein the frequency parameters are line spectral pairs.

3. The speech coding apparatus according to claim 1, wherein 25 said frequency parameter generating means comprises a correcting section for interpolating frequency parameters between the frequency parameters of the input signal and frequency parameters of white noise when the input signal is the non-speech signal, and for replacing the frequency parameters of the input signal by the frequency parameters interpolated.

4. The speech coding apparatus according to claim 1, wherein  
said frequency parameter generating means comprises a linear  
prediction analyzer for computing linear prediction  
coefficients from the input signal, at least one bandwidth  
expanding section for carrying out bandwidth expansion of the  
linear prediction coefficients when the input signal is the  
non-speech signal; and at least one converter for generating line  
spectral pairs from the linear prediction coefficients passing  
through the bandwidth expansion as the frequency parameters.

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5. The speech coding apparatus according to claim 1, wherein  
said frequency parameter generating means comprises at least one  
white noise superimposing section for superimposing white noise  
on the input signal when the input signal is the non-speech signal,  
and at least one linear prediction analyzer for computing linear  
prediction coefficients from the input signal on which the white  
noise is superimposed.

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6. The speech coding apparatus according to claim 1, wherein  
said quantization means comprises a first quantization section  
for selecting, when the input signal is the speech signal,  
codewords of the input signal according to the frequency  
parameters of the speech signal by referring to quantization  
codebook, and a second quantization section for selecting, when  
20 the input signal is the non-speech signal, codewords of the input  
signal according to the frequency parameters of the non-speech  
signal by referring to quantization codebook.

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7. The speech coding apparatus according to claim 1, further  
comprising a non-speech signal detector for detecting a type of  
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the non-speech signal from the input signal, wherein said frequency parameter generating means comprises a correcting section for correcting, when the input signal is the non-speech signal, the frequency parameters of the input signal according  
5 to the type of the non-speech signal detected by the non-speech signal detector.

8. The speech coding apparatus according to claim 1, further comprising selecting means for selecting a codeword that will  
10 minimize quantization distortion from a plurality of codewords,  
wherein

      said frequency parameter generating means comprises  
      correcting means for correcting the frequency parameters of the  
      non-speech signal when the input signal is the non-speech signal,  
15       said correcting means including one of three sets consisting of  
      a plurality of correcting sections, a plurality of bandwidth  
      expansion sections and a plurality of white noise superimposing  
      sections, said correcting sections correcting the frequency  
      parameters of the non-speech signal with different interpolation  
20       characteristics between the frequency parameters of the input  
      signal and frequency parameters of white noise, said bandwidth  
      expansion sections carrying out bandwidth expansion of the  
      non-speech signal by different characteristics, and said white  
      noise superimposing sections superimposing different level  
25       white noises on the input signal, and said frequency parameter  
      generating means generates the frequency parameters of a  
      plurality of non-speech signal streams from the outputs of the  
      correcting means;

      said quantization means includes a plurality of  
30       quantization sections for selecting codewords corresponding to

the frequency parameters of the non-speech signal streams, and for outputting the codewords with quantization distortions at that time; and

said selecting means selects codeword that will minimize  
5 quantization distortion from the plurality of codewords selected by said quantization sections.

9. A speech coding apparatus for coding an input signal consisting of one of a speech signal and a voice-band non-speech  
10 signal, said speech coding apparatus comprising:

discriminating means for deciding as to whether the input signal is a speech signal or a non-speech signal;

frequency parameter generating means for generating frequency parameters that indicate characteristics of a  
15 frequency spectrum of the input signal;

a quantization codebook for storing codewords of a predetermined number of frequency parameters;

at least one codebook subset including a subset of the codewords stored in said quantization codebook; and

20 quantization means for selecting, when said input signal is the speech signal, codewords corresponding to the frequency parameters of the input signal by referring to said quantization codebook, and for selecting, when said input signal is the non-speech signal, codewords corresponding to the frequency  
25 parameters of the input signal by referring to said codebook subset.

10. The speech coding apparatus according to claim 9, wherein the frequency parameters are line spectral pairs.

11. The speech coding apparatus according to claim 9, wherein  
said codebook subset consists of codewords selected from among  
the codewords in said quantization codebook, the codewords  
selected having small quantization distortion involved in  
5 quantizing the frequency parameters of the non-speech signal.

12. The speech coding apparatus according to claim 9, further  
comprising codeword selecting means for adaptively selecting,  
from among the codewords in said quantization codebook,  
10 codewords with small quantization distortion involved in  
quantizing the frequency parameters of the non-speech signal,  
wherein said codebook subset includes the codewords output from  
said codeword selecting means.

15 13. The speech coding apparatus according to claim 9, further  
comprising a non-speech signal detector for detecting a type of  
the non-speech signal from the input signal, wherein  
said codebook subset includes a plurality of codebook  
subsets corresponding to the types of the non-speech signal  
20 detected by said non-speech signal detector; and  
said quantization means includes a selector for selecting,  
when the input signal is the non-speech signal, one of said  
plurality of codebook subsets according to the type of the  
non-speech signal detected by said non-speech signal detector,  
25 in order to select a codeword corresponding to the frequency  
parameters of the non-speech signal.

14. The speech coding apparatus according to claim 12, further  
comprising a correcting section for correcting the frequency  
30 parameters of the non-speech signal, wherein according to the

frequency parameters after the correction by said correcting section, said codeword selecting means adaptively selects, from among the codewords in said quantization codebook, codewords that will cause small quantization distortion in quantizing the 5 frequency parameters of the non-speech signal, and supplies the selected codewords to said codebook subset.

15. The speech coding apparatus according to claim 12, further comprising second frequency parameter generating means for 10 generating frequency parameters by interpolating between the frequency parameters of the input signal and frequency parameters of white noise, wherein

15 said codeword selecting means quantizes the frequency parameters generated by said second frequency parameter generating means, and selects the codewords of said codebook subset considering quantization distortion involved in the quantization.

16. The speech coding apparatus according to claim 12, further 20 comprising second frequency parameter generating means including a linear prediction analyzer for computing linear prediction coefficients from the input signal, a bandwidth expansion section for carrying out bandwidth expansion of the linear prediction coefficients, and a converter for generating, 25 as the frequency parameters, line spectral pairs from the linear prediction coefficients passing through the bandwidth expansion, wherein

30 said codeword selecting means quantizes the frequency parameters generated by said second frequency parameter generating means, and selects the codewords of said codebook

subset considering quantization distortion involved in the quantization.

17. The speech coding apparatus according to claim 12, further comprising second frequency parameter generating means including a white noise superimposing section for superimposing white noise on the input signal, and a converter for generating the frequency parameters from the input signal on which the white noise is superimposed, wherein

10 said codeword selecting means quantizes the frequency parameters generated by said second frequency parameter generating means, and selects the codewords of said codebook subset considering quantization distortion involved in the quantization.

15 18. The speech coding apparatus according to claim 9, wherein said frequency parameter generating means comprises:

a linear prediction analyzer for computing linear prediction coefficients from the input signal; and

20 an LPC-to-LSP converter for converting the linear prediction coefficients into line spectral pairs used as the frequency parameters; and wherein

said quantization means comprises:

25 an inverse synthesis filter for carrying out inverse synthesis filtering of the input signal according to filtering characteristics based on the linear prediction coefficients when the input signal is the non-speech signal;

an LSP inverse-quantization section for generating line spectral pairs by dequantizing codewords in said codebook 30 subset when the input signal is the non-speech signal;

an LSP-to-LPC converter for converting the line spectral pairs generated by said LSP inverse-quantization section into linear prediction coefficients;

a synthesis filter for carrying out synthesis

5 filtering of the signal generated by said inverse synthesis filter according to filtering characteristics based on the linear prediction coefficients output from said LSP-to-LPC converter; and

a distortion minimizing section for selecting

10 codewords that will minimize quantization distortion when the input signal is the non-speech signal according to errors between the input signal and the speech signal synthesized by said synthesis filter.

15 19. The speech coding apparatus according to claim 9, wherein said frequency parameter generating means comprises:

a linear prediction analyzer for computing linear prediction coefficients from the input signal; and

20 an LPC-to-LSP converter for converting the linear prediction coefficients into line spectral pairs used as the frequency parameter; and wherein

said quantization means comprises:

25 an inverse synthesis filter for carrying out inverse synthesis filtering of the input signal according to filtering characteristics based on the linear prediction coefficients when the input signal is the non-speech signal;

an LSP inverse-quantization section for generating line spectral pairs by dequantizing codewords in said codebook subset when the input signal is the non-speech signal;

30 an LSP-to-LPC converter for converting the line spectral

pairs generated by said LSP inverse-quantization section into linear prediction coefficients;

a synthesis filter for carrying out synthesis filtering of the signal generated by said inverse synthesis filter according to filtering characteristics based on the linear prediction coefficients output from said LSP-to-LPC converter;

a first non-speech signal detector for detecting a non-speech signal from the input signal;

10 a second non-speech signal detector for detecting a non-speech signal from the speech signal output from said synthesis filter; and

a comparator for selecting codewords that will make a type of the non-speech signal that is detected by said first 15 non-speech signal detector identical to a type of the non-speech signal that is detected by said second non-speech signal detector.

20. The speech coding apparatus according to claim 9, further comprising optimization means for causing said quantization means to select optimum codewords according to a closed loop search method by comparing the input signal with a signal that is decoded from the codewords selected by said quantization means.